

CLAIMS

What is Claimed is:

1. A power transfer assembly for use in a motor vehicle to transfer drive torque from a powertrain to first and second drivelines, comprising:

an input shaft driven by the powertrain;

a first drive mechanism having a first input driven by said input shaft and a first output connected to the first driveline;

a second drive mechanism having a second input and a second output connected to the second driveline;

a bi-directional overrunning mode clutch having a first member supported for rotation relative to said input shaft, a second member driving said second input, and a plurality of third members located between said first and second members, said mode clutch is operable in a first mode to permit relative rotation between said first and second members in a first direction and prevent relative rotation therebetween in a second direction, said mode clutch is further operable in a second mode to prevent relative rotation between said first and second members in both directions;

a disconnect clutch operable in a first mode to couple said first member of said mode clutch to said input shaft and in a second mode to release said first member from coupled engagement with said input shaft;

a shift mechanism for shifting said mode clutch between its first and second modes and said disconnect clutch between its first and second modes; and

an actuator for controlling movement of said shift mechanism between a first position and a second position, said shift mechanism is operable in its first position to shift said mode clutch into its first mode and said disconnect clutch into its first mode, and said shift mechanism is operable in its second position to shift said mode clutch into second mode and said disconnect clutch into its second mode.

2. The power transfer assembly of Claim 1 wherein said mode clutch includes a mode shift member that is moveable between first and second positions to establish said corresponding first and second modes, wherein said disconnect clutch includes a disconnect shift member that is moveable between first and second positions to establish said corresponding first and second modes, and wherein said shift mechanism is operable to coordinate movement of said mode shift member and said disconnect shift member such that movement of said shift mechanism to its first position causes movement of said mode shift member to its first position and movement of said disconnect shift member to its first position, and wherein movement of said shift mechanism to its second position causes movement of said mode shift member to its second position and movement of said disconnect shift member to its second position.

3. The power transfer assembly of Claim 2 wherein said shift mechanism is a cam plate having first and second cam surfaces and which can be rotated between said first and second positions, said shift mechanism also comprising a mode shift device having a first follower engaging said first cam surface such that rotation of said cam plate controls movement of said mode shift member between its first and second positions, and a disconnect shift device having a second follower engaging said second cam surface such that rotation of said cam plate controls movement of said disconnect shift member between its first and second positions, wherein said actuator controls rotation of said cam plate between its first and second positions.

4. The power transfer assembly of Claim 3 wherein said cam plate is further rotatable to a third position for causing said mode shift member to move to its second position and said disconnect shift member to move to its first position.

5. The power transfer assembly of Claim 1 wherein said actuator is further operable to move said shift mechanism to a third position for causing said mode clutch to be shifted into its second mode and said disconnect clutch to be shifted into its first mode.

6. The power transfer assembly of Claim 5 further comprising:

a mode selector for permitting selection of one of a two-wheel drive mode, an on-demand four-wheel drive mode, and a locked four-wheel drive mode; and

a control unit for receiving a mode signal from said mode selector and causing said actuator to move said shift mechanism to establish the selected drive mode, said shift mechanism is operable in its first position to establish said two-wheel drive mode, said shift mechanism is operable in its second position to establish said on-demand four-wheel drive mode, and in its third position to establish said locked four-wheel drive mode.

7. The power transfer assembly of Claim 1 wherein said first drive mechanism includes a ring gear fixed to said input shaft and a pinion gear meshed with said ring gear that is fixed to a pinion shaft coupled to the first driveline, and wherein said second drive mechanism includes a differential interconnecting said second input to the second driveline.

8. The power transfer assembly of Claim 7 wherein said second drive mechanism includes a reduction unit having a first gear fixed for rotation with said second member of said mode clutch, a fixed second gear, and a third gear meshed with said first and second gears, and wherein said third gear drives said differential.

9. A power transfer unit for transferring drive torque from a powertrain to front and rear drivelines comprising:

an input driven by the powertrain;

a first output for transmitting drive torque from said input to the rear driveline;

a second output connected to the front driveline;

a bi-directional overrunning mode clutch operably disposed between said input and said second output, said mode clutch is operable in an AUTO mode to permit relative rotation between said input and said second output in a first direction and prevent relative rotation therebetween in a second direction, and said mode clutch is operable in a LOCK mode to prevent relative rotation between said input and said second output in both directions;

a disconnect clutch operable in a 2WD mode to release said mode clutch from coupled engagement with said input and in a 4WD mode to couple said mode clutch to said input; and

a shift mechanism for shifting said mode clutch between its AUTO and LOCK modes and said disconnect clutch between its 2WD and 4WD modes.

10. The power transfer unit of Claim 9 wherein said mode clutch includes a mode actuator that is moveable between first and second position to establish said AUTO and LOCK modes, wherein said disconnect clutch includes a disconnect actuator that is moveable between first and second positions to establish said 2WD and 4WD modes, and wherein said shift mechanism is operable to coordinate movement of said mode actuator and said disconnect actuator.

11. The power transfer unit of Claim 10 wherein an on-demand four-wheel drive mode is established when said mode actuator is in its first position and said disconnect actuator is in its second position, wherein a part-time four-wheel drive mode is established when said mode actuator is in its second position and said disconnect actuator is in its second position, and wherein a two-wheel drive mode is established when said mode actuator is in its second position and said disconnect actuator is in its first position.

12. The power transfer unit of Claim 9 wherein said bi-directional overrunning mode clutch includes a first ring supported on said input, a second ring, and rollers in rolling engagement with cam surfaces of said first and second rings, said second ring is adapted to circumferentially index relative to said first ring to cause said rollers to engage said cam surfaces and frictionally couple said second ring to said second output, and wherein said disconnect clutch is operable in its 4WD mode to releaseably couple said first ring to said input.

13. A power transfer assembly for use in a motor vehicle to transfer drive torque from a powertrain to first and second drivelines, comprising:

an input driven by the powertrain;

a center differential driven by said input and having first and second outputs;

a first drive mechanism connecting said first output to the first driveline;

a second drive mechanism connecting said first output to the second driveline;

a bi-directional overrunning mode clutch having a first member supported for rotation relative to first output, a second member coupled to said second output, and a plurality of third members located between said first and second members, said mode clutch is operable in an AUTO mode to permit relative rotation between said first and second members in a first direction and prevent relative rotation therebetween in a second direction, said mode clutch is further operable in a LOCK mode to prevent relative rotation between said first and second members in both directions;

a disconnect clutch operable in a first mode to couple said first member of said mode clutch to said first output and in a second mode to release said first member from coupled engagement with said first output; and

a shift mechanism for shifting said mode clutch between its AUTO and LOCK modes and said disconnect clutch between its first and second modes.

14. The power transfer assembly of Claim 13 further comprising an actuator for controlling movement of said shift mechanism between a first position and a second position, said shift mechanism is operable in its first position to shift said mode clutch into its AUTO mode and said disconnect clutch into its first mode, and said shift mechanism is operable in its second position to shift said mode clutch into LOCK mode and said disconnect clutch into its second mode.

15. The power transfer assembly of Claim 14 wherein said mode clutch includes a mode shift member that is moveable between first and second positions to establish said corresponding AUTO and LOCK modes, wherein said disconnect clutch includes a disconnect shift member that is moveable between first and second positions to establish said corresponding first and second modes, and wherein said shift mechanism is operable to coordinate movement of said mode shift member and said disconnect shift member such that movement of said shift mechanism to its first position causes movement of said mode shift member to its first position and movement of said disconnect shift member to its first position, and wherein movement of said shift mechanism to its second position causes movement of said mode shift member to its second position and movement of said disconnect shift member to its second position.

16. The power transfer assembly of Claim 15 wherein said shift mechanism is a cam plate having first and second cam surfaces and which can be rotated between said first and second position, and wherein said shift mechanism also comprising a mode shift device having a first follower engaging said first cam surface such that rotation of said cam plate controls movement of said mode shift member between its first and second positions, and a disconnect shift device having a second follower engaging said second cam surface such that rotation of said cam plate controls movement of said disconnect shift member between its first and second positions, wherein said actuator controls rotation of said cam plate between its first and second positions.

17. The power transfer assembly of Claim 16 wherein said cam plate is further rotatable to a third position for causing said mode shift member to move to its second position and said disconnect shift member to move to its first position.

18. The power transfer assembly of Claim 14 wherein said actuator is further operable to move said shift mechanism to a third position for causing said mode clutch to be shifted into its LOCK mode and said disconnect clutch to be shifted into its first mode.

19. The power transfer assembly of Claim 18 further comprising:

a mode selector for permitting selection of one of a two-wheel drive mode, an on-demand four-wheel drive mode, and a locked four-wheel drive mode; and

a control unit for receiving a mode signal from said mode selector and causing said actuator to move said shift mechanism to establish the selected drive mode, said shift mechanism is operable in its first position to establish said two-wheel drive mode, is operable in its second position to establish said on-demand four-wheel drive mode, and is operable in its third position to establish said locked four-wheel drive mode.

20. A motor vehicle comprising:
- a powertrain for generating drive torque;
 - a primary driveline including a primary differential interconnecting a driveshaft to a pair of primary wheels;
 - a secondary driveline having a pair of secondary wheels;
 - a power transfer assembly having an input driven by said powertrain, a first drive mechanism connecting said input to said driveshaft, a second drive mechanism driving said secondary wheels, a bi-directional overrunning mode clutch operably disposed between said input and said second drive mechanism, said mode clutch is operable in an AUTO mode to permit relative rotation between said input and said second drive mechanism in a first direction and prevent relative rotation therebetween in a second direction, and said mode clutch is operable in a LOCK mode to prevent relative rotation between said input and said second drive mechanism in both directions, a disconnect clutch operable in a 2WD mode to release said mode clutch from coupled engagement with said input and in a 4WD mode to couple said mode clutch to said input; and
 - a shift system for shifting said mode clutch between its AUTO and LOCK modes and said disconnect clutch between its 2WD and 4WD modes.

21. The motor vehicle of Claim 20 wherein said mode clutch includes a mode actuator that is moveable between first and second position to establish said AUTO and LOCK modes, wherein said disconnect clutch includes a disconnect actuator that is moveable between first and second positions to establish said 2WD and 4WD modes, and wherein said shift mechanism is operable to coordinate movement of said mode actuator and said disconnect actuator.

22. The motor vehicle of Claim 21 wherein an on-demand four-wheel drive mode is established when said mode actuator is in its first position and said disconnect actuator is in its second position, wherein a part-time four-wheel drive mode is established when said mode actuator is in its second position and said disconnect actuator is in its second position, and wherein a two-wheel drive mode is established when said mode actuator is in its second position and said disconnect actuator is in its first position.

23. The motor vehicle of Claim 20 wherein said bi-directional overrunning mode clutch includes a first ring supported on said input, a second ring, and rollers in rolling engagement with cam surfaces of said first and second rings, said second ring is adapted to circumferentially index relative to said first ring to cause said rollers to engage said cam surfaces and frictionally couple said second ring to said second drive mechanism, and wherein said disconnect clutch is operable in its 4WD mode to releaseably couple said first ring to said input.

24. The motor vehicle of Claim 23 wherein said second drive mechanism includes a reduction unit and a secondary differential, said reduction unit includes a first gear fixed for rotation with said second ring, a second gear fixed against rotation, and a third gear meshed with said first and second gears and supported from a carrier fixed to an input of said secondary differential, said secondary differential having a pair of outputs connected to said secondary wheels.